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# REPAIR AND CALIBRATION OF SURVEY INSTRUMENTS IN THE EASTERN AND SOUTHERN AFRICAN SUBREGION

by

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RCSSMRS

## I. INTRODUCTION

1. The Regional Centre for Services in Surveying, Mapping and Remote Sensing, as part of its main objectives, carries out repairs and calibration of theodolities, levels, photogrammetric plotters, distance measuring instruments and other surveying instruments for the member States of the Eastern and Southern African subregion. Over and above this the Centre conducts training programmes in the repair and calibration of these instruments to enable nationals of member States to gain sufficient knowledge and practical skills to be able to look after their own instruments.

2. Over the years, almost all countries in the region have acquired a lot of survey instruments through either donor technical assistance or direct purchase from the manufacturers. At the time of acquiring these instruments, the manufacturers were prepared to offer regular after-sale service or even attend to break down problems. Gradually, this trend changed to the present case where manufacturers are no longer willing to provide this essential service.

3. Consequently, in many countries, either fairly new instruments are written-off for lack of service and maintenance facilities within the country or a lot of the scarce foreign exchange is spent to either send the instruments abroad for repair or bring maintenance technicians from overseas. Either way, the debilitating financial situation that is already prevalent in the subregion is only made worse.

## II. SERVICES OFFERED BY THE REGIONAL CENTRE FOR SERVICES IN SURVEYING, MAPPING AND REMOTE SENSING

### A. Repair and maintenance services

4. Having recognized the above situation, RCSSMRS established the repair and maintenance service for its member States in 1979. Over the last nine years, more than 8,000 pieces of instruments have been serviced in the Eastern and Southern Africa subregion. Not only has this meant a lot of savings on the financial resources of the member States, it has also meant that projects that required these instruments have been able to continue.

5. The task of meeting the service requirements of such a diverse subregion has not progressed without any hitches. For various reasons, the subregion has a diverse collection of survey equipment from different manufacturers such as Wild, Kern, Zeiss, MOM, Bilger-Watts, Sokissha, just to mention a few.

6. The engineering department of the Centre has the capacity to repair and calibrate all these makes of instruments based on the factory training that the staff have obtained from the three main suppliers: Kern, Wild, and Zeiss.

7. In general therefore, the repair and calibration of some makes of instruments is dependent on the availability of appropriate service manuals and spare parts. There have been cases where manufacturers have not co-operated in the provision of spare parts and service manuals. In such cases, the Centre can do nothing but return the instrument to either the owners or forward it to the manufacturers on their behalf.

8. In cases where service manuals and spare parts are available, the Centre has no service problems whatsoever. It does however take time to procure the required spares as they have to be ordered directly from the factories. It may be necessary

at some stage, depending on the availability of funds, to stock those parts that get changed regularly for the purposes of increasing the instrument availability time and minimizing the mean time between failures (MTBF).

9. In addition to servicing of surveying instruments, the Centre having recognized the lack of back-up technical service for map processing and printing equipments in the region, has diversified its capability to cover these. Here again since there are a lot of different manufacturers of these instruments, each one is repaired and calibrated dependent on the availability of service manuals and spare parts. At the moment, none of the staff has been specifically trained on any of these instruments and therefore the amount of assistance the Centre can offer in this area is limited.

10. The list of equipment from the different manufacturers that the Centre is competent to repair and calibrate is shown in the annex to this paper.

B. Training in the repair and calibration of survey instruments

11. The Centre has a two-level maintenance policy in the repair and maintenance of survey equipment as follows:

(a) Level 1: At this level the basic cleaning, adjusting and the detection and correction of minor faults is performed monthly or longer interval depending upon the use of the instrument and conditions of storage;

(b) Level 2: Here the instrument is dismantled, all parts are cleaned/polished and greased as necessary, worn-out parts replaced, reassembled and calibrated accordingly. This being a comprehensive service, it is only necessary every two years or so, again depending upon use and local environmental conditions (coastal and desert areas may require this service on an annual basis).

12. Considering the 'catchment' area of the Centre, it is not possible to send a service team to every country more than once a year. For this reason, it is essential to establish a team of service personnel in each country who perform the level 1 service on a regular basis on all the country's equipment. In this way, instruments will be in use most of the time rather than on the shelf waiting for the Centre's service team to attend to them.

13. For this reason, training in the repair and calibration of survey instruments for level 1 is given high priority within the Centre's training programme.

14. A one-to-one practical training programme is arranged for participants on any pre-selected instruments. This, unlike the factory training where an individual follows book instructions, provides the individual not only with the required knowledge and practical skills but also encourage the rare "personal touch" of sharing experiences. The staff have years of practical experience in this job, initially obtained from the instrument factories and further complemented by the variety of instruments they have to repair and calibrate each year.

15. One of the problem areas here is the retention of the practical skills acquired. It is a known fact that unless one practises these skills regularly, it will not be possible for one to remember all the intricate service details when required. In most organizations, because of limited number of instruments, it is not possible to practise these skills on a regular basis, hence the effectiveness

of their trained service personnel becomes limited. This is one of the reasons for emphasizing the training for level 1 which needs to be done on a regular basis.

16. It is also essential for the Centre to have contact persons within organizations for the purposes of getting details of faults on instruments when they occur so that appropriate spares may be obtained in advance.

17. Since the technology is continuously changing, it is an essential pre-requisite for a good maintenance policy to re-train its personnel on a regular basis even if on the same instrument depending on the amount of exposure to that instrument.

18. In this way, the individual countries with such instruments shall help the Centre in its untiring efforts to repair and calibrate the instruments in the Eastern and Southern African subregion.

## III. CONCLUSIONS

19. It is a fact that most countries in the subregion cannot afford to replace their survey instruments due to limited financial resources. This being the case, it is necessary to adopt a good maintenance schedule for the purpose of extending the life expectancy of the instruments and to train national personnel in the repair and calibration of these instruments. This will guarantee that the instruments will be fully utilized thereby getting the most out of them.

20. It is a known fact that the repair and calibration services that the Centre is offering to its member States is the only one of its kind in the subregion. The financial savings that accrue from such services is immense.

21. For the purpose of having a good maintenance policy for these special instruments, it is highly recommended that each organization identifies a few technical staff for training at the Centre in the care and maintenance of the instruments.

ANNEX

INSTRUMENTS AND EQUIPMENTS SERVICED BY THE CENTRE

(a) OPTICAL INSTRUMENTS

| | |
|---|---|
| Wild Levels: | NAO, NAKO NAK1, NA2, NAK2, NO1, NK01, NO5, N1, NK1, N2, and N3. |
| Wild Theodolites: | TO5, TO, T1, T16, T2, T3, T4 and RDS. |
| Wild Photogrammetric Equipment: | B8, B8S, A9, A7, A10, VG1, PUG3, PUG4, TSP1, ST4. |
| Wild Miscellaneous Equipment: | RK1, ZBL, ZL, NL, GDP3, DF6, TMO, Tripods, etc. |
| Kern Levels: | CKO, CKOA, GK1, GK1-A, GK2A and GK23, |
| Kern Theodolites: | KIS, KIA, DKM1, DKM2, DKM2A, KOS and KIRA. |
| Kern Theodolites: Equipment. | Tripods, Tribrachs, etc. |
| Zeiss Levels: | NI1, NI2, NI4, N42 and NI62. |
| Zeiss Theodolites: | TH2, TH42, and TH51. |
| Zeiss Miscellaneous: Equipment: | Tripods, Tribrachs, etc. |
| Other Makes: | Watts, Nikon, Sokissha, etc., can also be serviced and repaired when spares are available. |

(b) ELECTRONIC INSTRUMENTS

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|---|---|
| Wild: | DI10, D13, D13s, D14, D14P D120. Supper Bettle and Citation, RC8, RC10, RC10A and NF2, EKS, EK20 and EK |
| Kern: | DM101, DM500, DM501, DM502, DM503 and DM200C. |
| Zeiss: | ELD11, ELD12, ELD13 and ELD14, SM1, SM2, SM3 and SM4, ELTA1, ELTA2, ELTA3 and ELTA4. |

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|---|---|
| AGA | AGA110, 112, 14A, 120, 116, 6A and 6B. |
| Other Makes: | Where spares and service manuals are available most electronic equipment can be serviced at the Centre. |